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(12) PATENT SPECIFICATION
ABSTRACT
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(54) PIPE JOINT
(71) SLOANE R. & G. MANUFACTURING CO. INC.
(72) BLUMENKRANZ J.J.
(74) DM

(57) A method of forming a fluid-tight joint is also claimed.

CLAIM

1. A fluid-tight pipe joint comprising: an annular plastic threaded fitting, a nut threadedly engaging said fitting, a plastic pipe projecting axially through said nut into said fitting, a sealing ring disposed between said fitting and said nut in fluid-tight sealing relation therewith, at least one radially compressible holding member disposed between said fitting and said nut having a plurality of cutters projecting radially from its inner surface and penetrating the outer surface of said pipe to anchor said pipe against axial separation from said fitting, and compression means responsive to rotation of said nut for radially compressing said holding ring against said pipe thereby causing and maintaining penetration of said pipe by said cutters.

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

(Original)

FOR OFFICE USE

31334m

Class Int. Class

Application Number:
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:

Name of Applicant: R & G SLOANE MANUFACTURING COMPANY, INC.

Address of Applicant: 7606 North Clybourn Avenue,
Sun Valley, California,
United States of America.

Actual Inventor(s): JAMES J. BLUMENKRANZ

Address for Service: DAVIES & COLLISON, Patent Attorneys,
1 Little Collins Street, Melbourne, 3000

Complete specification for the invention entitled:

"PIPE JOINTS AND METHOD FOR FORMING SUCH JOINTS"

The following statment is a full description of this invention, including the best method of performing it known to us :-

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1973

APPLICATION FOR A PATENT

31334/77

We, R & G SLOANE MANUFACTURING COMPANY, INC., of
7606 North Clybourn Avenue,
Sun Valley, California,
United States of America,

hereby apply for the grant of a Patent for an invention entitled:

"PIPE JOINTS AND METHOD FOR FORMING SUCH JOINTS"

which is described in the accompanying complete specification.

The application is a convention application and is based on the application(s) for patent or similar protection made

in UNITED STATES OF AMERICA
on 22nd. April, 1977 under No. 789,880
in
on under No.

Our address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

DATED this 6th. day of December, 1977.

AUSTRALIAN
GNB
-7 DEC 1977
PATENT OFFICE

H. N. Rimington

(a member of the firm of DAVIES & COLLISON)
for and on behalf of the applicant

TO: The Commissioner of Patents
WODEN ACT 2606

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1966

DECLARATION IN SUPPORT OF CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

(The declaration shall be made by the applicant, or, if the applicant is a body corporate, by a person authorized by the body corporate to make the declaration on its behalf.)

In support of the Convention Application made for a patent ~~patent of addition~~ for an invention entitled 31334/77

"PIPE JOINTS AND METHOD FOR FORMING SUCH JOINTS"

Insert full name(s) and address(es) of declarant(s).

I ~~We~~ John J. Maher, of
7606 North Clybourn Avenue
Sun Valley, California
United States of America

do solemnly and sincerely declare as follows:—

Delete the words which are not applicable.

1. ~~(a) I am / We are the applicant for the patent / patent of addition~~

Insert full name of applicant Company.

~~or (b)~~ I am authorized by

R & G SLOANE MANUFACTURING COMPANY, INC.

the applicant___ for the patent ~~patent of addition~~ to make this declaration on its behalf.

Insert country and date of filing of each application on which priority is based.

Insert full name of applicant in each basic application.

2. The basic application___ as defined by Section 141 of the Act was ~~were~~ made

in United States of America on the 22nd of April, 1977

by James J. Blumenkranz

in___ on the___

by___

in___ on the___

by___

in___ on the___

by___

Delete the words which are not applicable.

Insert full name(s) and address(es) of actual inventor(s).

3. ~~I am / We are~~ [illegible]

~~[illegible]~~ James J. Blumenkranz
7312 Woodrow Wilson Drive
~~[illegible]~~ Hollywood, California
United States of America

is ~~are~~ the actual inventor___ of the invention and the facts upon which the applicant___

is ~~are~~ entitled to make the application are as follows:—

State manner in which applicant(s) derive title from actual inventor(s).

the said R & G SLOANE MANUFACTURING COMPANY, INC. is the assignee of the said James J. Blumenkranz

AUSTRALIAN [illegible]
[illegible] 1977

4. The basic application___ referred to in paragraph 2 of this Declaration was ~~were~~ the first application___ made in a Convention country in respect of the invention the subject of the application.

Declared at Sun Valley this third day of November, 1977
United States of America

Signature(s) of declarant(s).

(No attestation or other signature is required.)

R & G SLOANE MANUFACTURING COMPANY, INC.

31334/77

This invention relates to pipe joints, and more particularly to fluid-tight joints for uses in fluid transmission systems.

Labor costs have become an increasingly higher portion of the cost of fluid transmission systems. The formation of pipe joints in particular is traditionally a labor intensive operation, and its high costs have led to the development of a variety of joint constructions that require less time and skill for their formation. The increased use of plastic pipe, which is relatively inexpensive, lightweight, and easily workable, has placed additional emphasis on the need for improved joints, since it has reduced the comparative cost of the other aspects of the systems.

Various types of plastic pipe joints have been proposed, many of which rely upon heat to fuse a fitting to the pipe. The careful application of sufficient heat to form a solid, leak-proof joint without unduly reducing the thickness of the pipe walls is a process that often requires skilled workmen and specialized tools, if damage to the pipe is to be avoided. While it is possible to form satisfactory joints in this way, such joints share, in lesser degree, many of the same economic disadvantages of the traditional joint constructions that they were intended to replace.

One previously known technique for joining pipe without fusion requires cutting a circumferential groove into the exterior surface of the pipe at a prescribed distance from the end. An attachment device is then provided which mechanically interlocks with the groove. Joints of this mechanical-interlock type often rely upon an annular member which is expanded by heating, slipped over the end of the pipe, and allowed to shrink until it permanently engages the groove. Other known joints avoid the necessity for the groove cutting operation by relying entirely upon radial compression of the fitting to anchor the pipe against axial separation from the fitting, but provide no positive retention against axial movement.

A principal objective of the present invention is to provide a reliable fluid-tight pipe joint that positively restrains the pipe against axial separation from the fitting, but does not require separate on-side fusing, threading or groove cutting operations.

31334/77

The present invention resides in a fluid-tight pipe joint which utilizes the components of the joint itself to perform all necessary working of the pipe surface, eliminating the need for separate cutting and heating steps. The entire joint is formed in one simple operation by positioning the components of the joining and sealing assembly on the pipe in the proper order and then tightening them with a wrench to cause radially inwardly projecting cutters on the inner surface of a holding ring to cut into the pipe as the ring is compressed and rotated, thereby anchoring the holding ring on the pipe to prevent axial movement or separation.

More specifically, the invention comprises an annular fitting in which one end of a pipe is slidably received and a nut that encircles the pipe and engages the threads on the fitting. A sealing ring pressed against the outside surface of the pipe prevents leakage of fluid through the joint. Axial movement of the pipe within the fitting and possible axial separation of the pipe from the fitting is prevented by a holding ring encircling the pipe and positioned alongside the sealing ring between the nut and the fitting. The holding ring is radially compressible and has cutters that project radially from its inner surface to penetrate the outer pipe surface for positive retention of the pipe.

In a preferred embodiment of the invention, the holding ring is split by a gap to permit radial compression, and the rotation of the nut is transmitted to the holding ring by a lug projecting from the nut that engages a notch formed on the holding ring adjacent the

31334/77

gap. Radial compression of the holding ring is achieved by a tapered edge of the ring that present a conical face engaged by a parallel conical face on the inside of the nut. As the nut advances axially toward the fitting, due to the engagement of the threads, the conical face of the nut slides axially on the conical face of the holding ring forcing the rotating ring radially inwardly against the pipe and causing the cutters to dig into the surface of the pipe.

All working of the surface of the pipe is accomplished by the holding ring cutters which become a permanent part of the finished joint. It is not necessary to provide specialized tools for heating or grooving the pipe, and relatively little skill is required to form the joint. The fitting, nut, holding ring, and sealing ring are prepared as a pre-assembled unit so that the installer on the job-site need only insert the pipe and tighten the nut. As the nut is tightened on the fitting, it causes the cutters of the holding ring to penetrate the surface of the pipe while simultaneously pressurizing the sealing ring.

Other features and advantages of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention.

FIGURE 1 is a perspective view of a preferred fluid-tight pipe joint embodying the novel features of the present invention;

FIGURE 2 is an enlarged, fragmentary, cross-sectional view of the joint of FIGURE 1, taken axially along the center of the joint;

FIGURE 3 is a further enlarged fragmentary portion of the cross section of FIGURE 2;

FIGURE 4 is a partially broken away perspective view of a nut that forms part of the joint;

FIGURE 5 is an enlarged perspective view of the holding

31334/77

ring and cutters; and

FIGURE 6 is an enlarged, fragmentary, end view showing a portion of the holding ring including one cutter.

Shown in the drawings for purposes of illustration is a pipe joint of a type used in chemical waste and other fluid transmission systems. In general, the joint comprises an annular pipe fitting 10 into which the one end portion of a pipe 11 is inserted, a nut 12 telescoped over the pipe and threaded onto the fitting, and a sealing ring 13 encircling the pipe inside the fitting and adapted to be pressed tightly against the pipe to prevent fluid leakage. The fitting 10, which may be part of an elbow, coupling or any other component of a conventional fluid transmission system, has a cylindrical end portion 14 connected by an inwardly tapered surface 15 to an axially aligned cylindrical sleeve 16 of lesser internal diameter. Angularly spaced knobs 17 on the external cylindrical surface 18 of the fitting permit it to be gripped conveniently and held against rotation. The pipe 11 passes through the end portion of the fitting, leaving an annular cavity between the outer surface of the pipe and the inner cylindrical surface of the end portion. The square cut pipe end is slidably received by the sleeve, stopping at an annular shoulder 19 at the inner end of the sleeve.

The sealing ring 13 that renders the joint fluid tight has an uninterrupted cylindrical inner surface 20 and a stepped outer surface 21, so that it forms a relatively thin annular leading portion 22 integrally formed with a relatively thick annular trailing portion 23, the leading portion having about half the thickness of the trailing portion. The pipe 11 is encircled by the sealing ring which fits beneath the tapered surface 15 and the cylindrical inner surface of the fitting end portion 14, as shown in FIGURE 2.

The nut 12, shown in FIGURE 4, has a threaded internal surface 24 that engages threads 25 on the outside of the fitting end portion 14, and a cylindrical surface 27 at its other end of lesser diameter than the threaded surface that slidably receives the pipe 11, as shown in greater detail in FIGURE 3. The annular cavity between the end portion of the fitting and the pipe continues between the nut and the pipe and is closed at its outer end by a conical face 28 that extends from the cylindrical surface of the nut. An external surface 29 of the nut is provided with axially extending ribs 30 by which it can be gripped and forcefully rotated.

Since the pipe 11 has no grooves or other deformations on its outer surface to anchor it within the joint and prevent axial movement that could cause leakage or complete axial separation, and since it is desired to avoid the necessity for fusing the pipe to the joint by the application of heat or preliminary grooving, a provision is built into the joint for positively engaging the outer cylindrical surface of the pipe. This is the function of a holding ring 31 that fits within the annular cavity between the pipe on the inside and the fitting end portion 14 and nut 12 on the outside, the sealing ring 13 being axially constrained within the same cavity between the holding ring and the tapered inner surface 15 of the fitting 10.

The holding ring 31, as shown in FIGURE 5, includes a generally annular body which is split by a gap 32 between two opposing ends 33 and 34, so that the ring can be compressed radially by closing the gap. It has a cylindrical inner surface 35 bounded on one circumferential edge by a blunt, annular, radial end surface 36 and on the opposite circumferential edge 37 by a conical face 38 that tapers radially outwardly toward the blunt end surface. The conical face is connected to the blunt end surface by a cylindrical outer surface 39 concentric with the inner surface.

So that the holding ring 31 can be interlocked with the nut

12 to transmit rotational forces from the nut to the ring, a notch 40 is formed on the tapered edge of the ring adjacent the gap 32. A plurality of elongated, pointed, ridge-shaped cutters 41 integrally formed with the body of the holding ring porject radially inwardly from the inner surface 35, as shown in FIGURE 5, to penetrate the outer surface of the pipe 11. The cutters are aligned with the circumference of the holding ring.

The retaining function of the cutters can best be appreciated from a consideration of the method by which the joint is assembled. The holding ring 31 is seated within the nut 12 so that the conical faces 28 and 38 of the nut and ring are parallel and oppose each other. A lug 42 that projects axially from the conical face 28 of the nut is received by a notch 40 of the holding ring so that the nut and ring are locked together for joint rotation. The sealing ring 13 is inserted in the fitting 10, and the nut is then threaded onto the fitting. The nut, fitting, and sealing rings thus form a pre-assembled unit.

At the job-site, the assembler merely inserts the pipe 11 into the pre-assembly and tightens the nut 12 onto the fitting 10. As the nut is rotated, it advances toward the fitting, sliding the holding and sealing rings 31 and 13 axially along the pipe and causing the leading portion 22 of the sealing ring to wedge beneath the tapered surface 15 of the fitting. The continued rotation of the nut also causes the conical nut face 28 to slide axially on the conical face 38 of the holding ring, thereby compressing the holding ring as the gap 32 closes. The cutters 41 penetrate the softer outer surface of the pipe, while the holding ring rotates with the nut, thereby firmly anchoring the pipe against axial movement within the fitting as shown in FIGURE 2. The axial movement of the nut also deforms and pressurizes the sealing ring between the tapered surface of the fitting and the outer surface of the pipe.

In this preferred embodiment, the pipe 11 is made of polypropylene plastic and the holding ring 31 is made of polyphenylene sulfide with forty percent glass filling. Other materials, including metals, may be used instead. For example, the pipe may be copper and the holding ring stainless steel. It is important that the cutters of the holding ring be substantially harder than the exterior of the pipe they must penetrate.

31334/77

It will be appreciated from the foregoing that the present invention provides fluid-tight pipe joints with positive pipe retention that can be assembled quickly without specialized tools. While a particular form of the invention has been illustrated and described, it will be apparent that various modifications can be made without department from the spirit and scope of the invention.

7·12·77 31334

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

31334/77

1. A fluid-tight pipe joint comprising: an annular plastic threaded fitting, a nut threadedly engaging said fitting, a plastic pipe projecting axially through said nut into said fitting, a sealing ring disposed between said fitting and said nut in fluid-tight sealing relation therewith, at least one radially compressible holding member disposed between said fitting and said nut having a plurality of cutters projecting radially from its inner surface and penetrating the outer surface of said pipe to anchor said pipe against axial separation from said fitting, and compression means responsive to rotation of said nut for radially compressing said holding ring against said pipe thereby causing and maintaining penetration of said pipe by said cutters.

2. The pipe joint as claimed in Claim 1, further comprising means for locking said holding ring to said nut for rotation therewith.

3. The pipe joint as claimed in Claim 2, wherein said holding member is a ring having a notch therein, and said locking means comprises a lug projecting from said nut and received by said notch.

4. The pipe joint as claimed in Claim 1, wherein said annular fitting includes an end portion having a cylindrical inner surface, a sleeve having a cylindrical surface axially aligned with and of lesser diameter than said cylindrical surface of said end portion, and a threaded surface, said pipe projecting axially through said end portion and into said sleeve.

5. The pipe joint as claimed in Claim 1, wherein said sealing ring is pressurized by a force exerted thereon by said holding ring.

6. The pipe joint as claimed in Claim 1, wherein said compression means includes a conical face formed on said nut that engages said holding member.

7. The pipe joint as claimed in Claim 6, wherein said

holding ring includes a conical exterior face engaged by said nut.

8. The pipe joint as claimed in Claim 1, wherein said holding ring has at least one gap therein to permit radial compression thereof.

9. The pipe joint as claimed in Claim 2, wherein said pipe is made of polypropylene and said holding ring is made of polyphenylene sulfide with glass filling.

10. A holding ring for anchoring a pipe in a fluid-tight joint and preventing axial movement of said pipe within said joint comprising a substantially annular body having at least one gap therein to permit radial compression thereof, a substantially annular inner surface having a plurality of cutters projecting radially inwardly therefrom to penetrate the exterior surface of a pipe, and a conical exterior surface by which said ring can be radially compressed by closing said gap to drive said cutters into the outer surface of the pipe.

11. The holding ring as claimed in Claim 10, wherein said cutters are formed by circumferentially oriented elongated ridges.

12. A method for forming a fluid-tight joint at one end of a pipe comprising: seating a holding ring having radially inwardly projecting cutters within a nut; sliding said nut and holding ring over a free end of a pipe; causing the threaded surface of said nut to engage a threaded surface of a fitting; positioning said pipe within said fitting and said nut; and rotating said nut, thereby rotating and radially compressing said holding ring and causing said cutters to penetrate the outer surface of said pipe to prevent axial movement of said pipe with respect to said holding ring and anchoring said pipe with respect to said fitting.

13. The method as claimed in Claim 12, further comprising positioning a sealing ring adjacent said holding ring and causing said holding ring to pressurize said sealing ring upon rotation of said nut.

14. The parts, elements, steps and features referred to or indicated in the specification and/or claims and/or drawings of this application, individually or collectively, and any and all combinations of any two or more of said parts, elements, steps or features.

Dated this 6th. day of December, 1977.

31334/77

R & G SLOANE MANUFACTURING COMPANY, INC.
by its Patent Attorneys
DAVIES & COLLISON.

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31334/77

Fig. 1

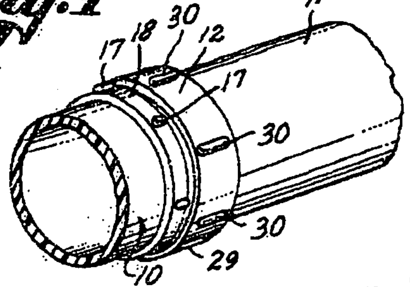

Fig. 3

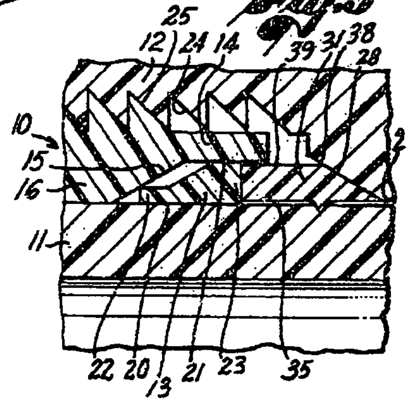

Fig. 2

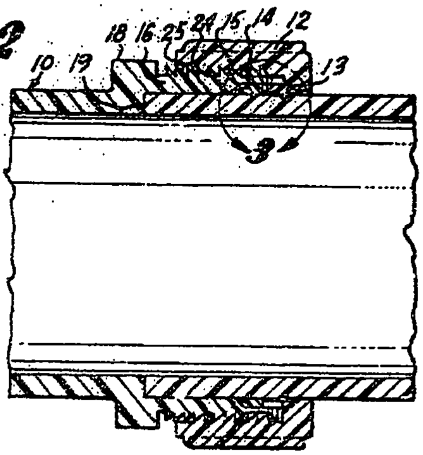

Fig. 6

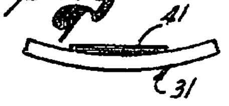

Fig. 4

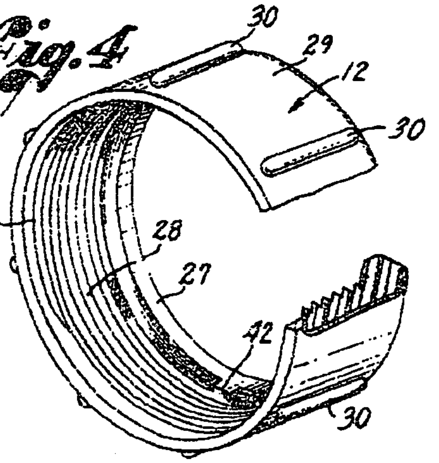

Fig. 5